

[0022] Those skilled in the art will appreciate the advantage of defining the track width and sensor width in a single photolithographic process on a planar surface. The first photolithographic process defines the inner and outer edges of the lead tabs in a single photolithographic process. As discussed above, the inner edges of the lead pads define the active area of the sensor and therefore define the track-width of the sensor. Since the lead tabs are used as a mask, the outer edges of the leads define the sensor width. It will be appreciated that the present invention allows significant misalignment of the first and second photolithographic processes without affecting the critical dimensions of the sensor, as will be discussed in greater detail below.

[0023] These and other aspects and advantages of the present invention will be better appreciated upon reading the following description taken together with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] FIG. 1 is a cross sectional view, not to scale, of a prior art lead overlay read sensor;

[0025] FIG. 2 is a cross sectional view, not to scale of a step in a prior art process of making a read sensor;

[0026] FIG. 3 is a cross sectional view, not to scale of a step in a prior art process of making a read sensor;

[0027] FIG. 4 is a cross sectional view, not to scale of a step in a prior art process of making a read sensor;

[0028] FIG. 5 is a plan view, not to scale, of a disk drive incorporating magnetic head according to the present invention;

[0029] FIG. 6 is a profile view, not to scale, taken along line 6-6 of FIG. 5;

[0030] FIG. 7 is an end view of a slider, not to scale, taken along line 7-7 of FIG. 5;

[0031] FIG. 8 is a sectional view of a read head, not to scale and shown enlarged, taken along line 8-8 of FIG. 7;

[0032] FIG. 9 is a sectional view, not to scale, depicting a step in a process of manufacturing a magnetic head according to the present invention;

[0033] FIG. 10 is a sectional view, not to scale, depicting a step in a process of manufacturing a magnetic head according to the present invention;

[0034] FIG. 11 is a sectional view, not to scale, depicting a step in a process of manufacturing a magnetic head according to the present invention;

[0035] FIG. 12 is a sectional view, not to scale, depicting a step in a process of manufacturing a magnetic head according to the present invention;

[0036] FIG. 13 is a flow chart illustrating steps in method of manufacturing a magnetic head according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0037] Referring now to the drawings, wherein like reference numerals designate like or similar parts throughout the several views, FIGS. 5-7 illustrate a magnetic disk drive

100. The drive 100 includes a spindle 102 that supports and rotates one or more magnetic disks 104. The spindle 102 is rotated by a motor 106 that is controlled by a motor controller 108. A combined read and write magnetic head 110 is mounted on a slider 112 that is supported by a suspension 114 and actuator arm 116. A plurality of disks, sliders and suspensions may be employed in a large capacity direct access storage device (DASD) as shown in FIG. 6. The suspension 114 and actuator arm 116 position the slider 112 so that the magnetic head 110 is in a transducing relationship with a surface of the magnetic disk 104. When the disk 104 is rotated by the motor 106, the slider is supported on a thin cushion of air (air bearing) between the surface of the disk 104 and an air bearing surface (ABS) 118. The magnetic head 110 may then be employed for writing information to multiple circular tracks on the surface of the disk 104, as well as for reading information therefrom. Processing circuitry 120 exchanges signals representing such information with the head 110, provides motor drive signals for rotating the magnetic disk 104, and provides control signals for moving the slider to various tracks. The various components making up the disk drive can be mounted on or within a chassis 122.

[0038] With reference now to FIG. 8, a cross sectional view, not to scale, as viewed from the ABS is depicted. Those skilled in the art will appreciate that such a magnetic head would also include a write head and first and second shields. However, for purposes of clarity only the read sensor and its associated leads are depicted. The read head includes a magnetoresistive sensor 126, which may be a GMR sensor as described with reference to the background art or could also be some other type of magnetoresistive sensor, such as TMR or AMR. The sensor 126 has a substantially flat surface 128 terminating in first and second laterally opposed edges 130, 132. The sensor 126 also has first and second sides 134, 136, which extend from the edges 130, 132 and slope downward to the substrate supporting the sensor 126. The substrate is preferably a non-magnetic electrically insulating gap layer 12 as described with reference to the background art and will hereafter simply be referred to as the substrate 12. It will be appreciated that while the sides 134, 136 are shown and described as sloping and having portions that are somewhat straight, the sides could also be of other configurations. For example, the sensor 126 could have vertical or nearly vertical side walls or they could also have a serpentine configuration or some other shape when viewed in cross section as in FIG. 8.

[0039] With continued reference to FIG. 8, first and second thin lead tabs 138, 140 are formed on the substantially flat surface 128 of the sensor 126. The thin lead tabs 138, 140 extend from inner lead edges 142, 144 to the outer edges 130, 132 of the sensor 126. The distance between the inner edges 142, 144 of the thin lead tabs 138, 140 defines the track width TW of the read head 124. Because the lead tabs 138, 140 are relatively thin, the inner edges 142, 144 can be formed to be well defined and accurately located. While the lead tabs 138, 140 could be constructed of various electrically conductive materials, they are preferably Rh. Furthermore, the tabs 138, 140 could be of various thicknesses, but are preferably 20-30 nm.

[0040] First and second hard bias layers 146, 148, deposited over the substrate 12, extend over the sides 134, 136, and may also extend over a portion of the thin lead tabs 138,